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NEW EARTHCOVERED MAGAZINE

A new application of pre-cast arches and reinforced soil allows quick and often less expensive construction of earth covered magazines. Magazines constructed with this technique have been developed as a design alternative for Army standard magazine 33-15-74. The design incorporates pre-cast arch and reinforced soil technology with a cast-in-place headwall. It was developed by the Reinforced Earth Company (TAI), in cooperation with U.S. Army Corps of Engineers Engineering and Support Center, Huntsville (USAESCH), and the U.S. Army Technical Center for Explosives Safety (USATCES). The design, which has been reviewed and approved by the Department of Defense Explosives Safety Board (DDESB) as a 7-bar magazine, is covered under drawing number 421-80-05 and is approved for new construction. Copies of the drawings can be obtained from Commander, U.S. Army Engineering and Support Center, Huntsville, ATTN: CEHND-ED, P. O. Box 1600, Huntsville, AL 35807-4301, telephone DSN 760-1402, commercial (205) 895-1402.

The pre-cast arch earth covered magazine provides an alternative to cast-in-place arch designs. It's equal in capacity and siting requirements to standard (7-bar) earth-covered magazines. However, construction using pre-cast arch segments has many economic advantages. The pre-casting makes the magazines quicker, and often cheaper, to build. The off-site casting allows

site preparation to proceed simultaneously and reduces on-site quality control problems.

The arch segments can be pre-cured at the casting location. Once they've been shipped to the site, the segments are set in poured concrete footings. After they've been set, the crown beam can be poured, the arch joints covered, and the backfill placed; no additional curing period is required.

TAI used finite element analysis to optimize the shape of the arch for load conditions. From this design, a form is developed. It can be used to rapidly cast identical sections. The duplication makes the pre-cast arch magazines particularly economical for building multiple, identical magazines resulting in a 20 to 40% cost savings.

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WEBSITE AT:**

www.dac.army.mil/es/

ACCIDENT REPORTING - DO IT RIGHT!

The U.S. Army requires that all accidents/incidents meeting reporting requirements be investigated and reported in accordance with AR 385-40, 1 Nov 94, Accident Reporting and Records, and DA Pam 385-40, 1 Nov 94, Army Accident Investigations and Reporting.

A survey of 201 explosives accidents, reported during the last five years (FY 95 through FY 99), revealed that 107 (53%) of the submitted reports failed to properly identify the explosives contributing to the event.



Specifically, AR 385-40, paragraph 9-4b, requires that "quantity, type, lot number, configuration, and packaging of ammunition/explosives involved in the accident" be reported. DA Pam 385-40, paragraph 4-7, figure 4-1, legend: Completion Instruction for DA Form 285, blocks 10, 52, and 53 provide detailed instruction for reporting ammunition/explosives involved in an accident.

The primary purpose of this reporting process is to capture and analyze pertinent factors that contributed to the event. Not fully utilized in the past, this

important information is now being closely scrutinized in an effort to determine trends leading up to or causing the accident. Commanders, system managers, and safety and health personnel utilize analysis of this data toward developing and implementing specific accident prevention measures.

Data gathered from accident analysis can lead to development of improved/safer handling procedures, possible design changes to make the item safer to employ, or even outright removal of the item from use.

As a recent example of the reporting system working, removal was the case recently when accident data was utilized as justification for permanently suspending the use of the 1370-L956, flash artillery simulator, M110, during any training activity.

The 1370-L956 was identified as contributing to numerous serious injuries of our military members during training activities and was permanently suspended from future use with units directed to turn in all unused assets.

The accident report data can be effectively utilized when followed!

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RECENT HQDA EXPLOSIVES SAFETY POLICY ACTIONS

In the past few months, the Office of the Director of Army Safety (ODASAF) and the Office of Deputy Chief of Staff, Logistics (ODCSLOG) have formulated and issued the following explosives safety policies. Copies of these policies can be obtained from our web site: www.dac.army.mil/es/.

Guidance on Uploaded Bradley Fighting Vehicles: On 8 Nov 99, the ODASAF released a message that gave explosives safety guidance for separations from Bradley fighting vehicles (BFV) uploaded with ammunition. If a BFV is uploaded with only 25mm ammunition and other small arms ammunition, with the hatches and ramp closed, then that BFV is considered "heavy armor." The heavy armor qualification allows such a BFV to have reduced quantity distance separations. Uploading with TOW missiles or other high explosives items removes the allowed reduction in quantity distance.

Storage of Operational, Training and Ceremonial Ammunition in Arms Rooms: On 13 Sep 99, the ODASAF released a memorandum detailing the Army policy regarding the storage of ammunition items in arms rooms. This policy discourages, but does allow the storage of limited quantities of hazard class/division (04)1.2, 1.3, and 1.4 ammunition in arms rooms for operational and training use. The policy also allows a very limited storage of ceremonial ammunition in arms rooms.

Explosives Safety Site Plans for Ranges: On 13 Dec 99, the ODASAF released a policy memorandum addressing the requirement for explosives safety site plans for range facilities. In short, fixed ammunition storage facilities (loading docks, concrete, gravel or unimproved locations) will require DDESB approved explosives safety site plans. A general area where field ammunition supply points are established will require a DDESB approved explosives site plan. Locations that demilitarize ammunition items will require DDESB approved explosives safety site plans. Firing points will not require DDESB approved explosives site plans. Facilities that support ranges that utilize only hazard class 1.4 ammunition will not require DDESB approved explosives site plans. The policy memo also addresses what range facilities require lightning protection systems.

Please be aware that these DA policies are the minimum Army requirement. Major Army commands (MACOMs) may have released more restrictive guidance.

Before personnel act on these policies, personnel should check with their MACOM safety offices to see if MACOM policy mirrors Army policy.

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FORCE PROTECTION - SUMMER'S COMING!


Summer is around the corner. We all know that certain events normally take place during summer months: picnics, sun-tanning on the beach, and increased armed forces training exercises. For us, the more relevant area is the increased training which takes place for various components of the U.S. Army.

The United States Army Technical Center for Explosives Safety (USATCES) has recently completed an evaluation of Army explosives accidents over the last five fiscal years, FY 95 through FY 99. This review has caused us to realize there is a bump during the summer months for explosives accidents during training.

Out of a total of 201 reported Army accidents/incidents involving explosives over this 5-year period: 149 of the 201 (74%) occurred during Army training activities.

Year		Jun	Jul	Aug	Sep	Subtotals
1995	Injuries	2	16	3	6	27
	Deaths		2			2
1996	Injuries	6	7	13	6	32
	Deaths	1		1	1	3
1997	Injuries	3	7	4	5	19
	Deaths					0
1998	Injuries	10	3	4	6	23
	Deaths				1	1
1999	Injuries	1	1	1		3
	Deaths	1				1
Total	Injuries	22	34	25	23	104
	Deaths	2	2	1	2	7

Table 1: Army injuries and fatalities from explosives during training.



Significantly, 70% (104) of the training accidents involving explosives occurred during the months of June through September. Based on the current Army accident data, we can clearly state that additional attention is warranted for training operations and activities during the summer months.

Every training operation can be divided into three basic parts (planning, operations, and recovery from range operations); safety must be included as a part of each of these steps. Operations safety must be included in the development of training operations and units must be informed that safety is an element which must be executed. Organizations going to ranges must be briefed and informed of the range safety requirements, through briefings and meetings conducted at the range.

When units arrive at the training areas, they should not just be left to their own devices. The units must be periodically monitored to ensure that explosives safety is being properly implemented. During the review of explosives accident data for FY95-99, some of the common causes of accidents/mishaps included one or more of the following:

- a. Inadequate supervision.
- b. Inadequate training.
- c. Failure to follow prescribed procedures/directives/standing operating procedures.
- d. Negligence.
- e. Curiosity.
- f. Rough handling of ordnance/explosives/ammunition.
- g. Picking up unexploded ordnance.
- h. Weapon malfunction.

Communications are an important part of safety. To ensure safety, at least two forms of communications should be required for training areas. If areas off limits to troop movements are violated, communications are vital in effecting a cease-fire.

At the end of the training mission, it is necessary to safely recover from the mission. Recovery will entail locating dud munitions—fired during the operation. With dud munitions accounting for a high percentage of injuries, it is important for such items to be marked and

range operations (RO) notified concerning the number of duds, type, location, etc. If you know where the dud is, you can avoid it: mark it, notify RO, and move on. Don't disturb it or figure that it would make an excellent paperweight.

As training picks up with the increased training missions, installations having training exercises must be ready to brief trainees (make sure that you are ready—preplan for it) and set up a system to monitor and provide assistance to the training activity and be ready to follow-up with constructive assistance and support to make this summer's Army training a safer operation.

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DO YOU HAVE IDEAS FOR ARTICLES INVOLVING EXPLOSIVES SAFETY?

Good ideas for explosives safety are everywhere! If there is a topic you would like to see researched or published in a future explosives safety bulletin, e-mail us at: cummings@dac-emh2.army.mil or durand@dac-emh2.army.mil.

COOK-OFFs

The heat generated from hot guns can cause premature firing of ammunition. As the title infers—this is a cook-off. Evaluation of Army explosives accidents over the last five fiscal years, FY95-99, has caused us to focus on two specific weapons: the 7.62mm M60 machine gun and the 5.56mm M249 light machine gun or squad automatic weapon (SAW).

TM 9-1005-224-10, 2 Apr 98, Machine Gun, 7.62-mm, M60, W/E and Mount, Tripod, Machine Gun, 7.62-mm, M122, gives safety information on the 7.62mm M60:



a. If cover is open on hot weapon (hot barrel), an open-cover cook-off could occur and result in serious injury or death. Recommended action is to close the cover and evacuate area for 15 minutes and then return to perform REMEDIAL ACTION of removing the round.

b. The climate temperature in different regions will make a difference on how quickly the gun becomes hot. On a hot sunny day, a cook-off can occur within 50 rounds.

During the 15-minute waiting period, the weapon should cool adequately. Unfortunately during training, many service members (SMs) do not take the appropriate 15-minute waiting period and are injured when the round cooks-off. In order to preserve the fire power of the M60, firing limitations are specified as follows:

a. Cyclic fire can generate a rate of fire of 550 rounds per minute and it is recommended that the barrel be changed every minute. With the M60, by adjusting the rate of fire, cook-offs can be minimized.

b. Rapid fire at 200 rounds per minute and it is recommended that the barrel be changed every 2 minutes.

c. Sustained fire is at 100 rounds per minutes (with the suggestion that 4 to 6 seconds be allowed between bursts). Recommend barrel change every 10 minutes.

FM 23-14, 26 Jan 94, M249 Light Machine Gun in the Automatic Rifle Role, gives safety information on the 5.56mm M249:

With the SAW, malfunctions occur due to mechanical failure. Faulty ammunition or improper operation by the rifleman is not considered a malfunction, instead it is considered a stoppage. When a stoppage occurs, a determination needs to be made as to the cause. IN TRAINING: If the weapon is cold (fired a few rounds over a long period of time), then POPP (pull, observe, push, and press) in accordance with FM 23-14. If the weapon is hot (firing 200 rounds in less than 2 minutes), move the safety to SAFE and let the weapon cool for 15 minutes prior to attempting to clear the weapon. DURING HEAT OF BATTLE: move safety to SAFE, wait 5 seconds, then POPP.

Remember, climate and rate of fire will contribute to how quickly a weapon gets hot, contributing to cook-off. Additionally, barrel temperature will be impacted by the type of ammunition fired: blanks, tracer, armor piercing, training rounds, etc.

The best recommendation for the SM is to know the weapon and to operate within its limitations.

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FATIGUE—A DIFFICULT ENEMY

Unplanned explosions in 80% of the situations can be traced back to human error. Protection of limited assets is vital and few countries can claim an inexhaustible source of service members (SM). In order to maintain the efficiency of a fighting force, it is necessary to train and protect SMs. Forms of training can vary from artillery firing ranges, ranges for tracked vehicles (tanks, personnel carriers, etc) which also use simulators, to field personnel use of the “exercise or mock battle”. Opposing forces test strategies, ploys and levels of endurance on the field and with this training, one of the enemies is fatigue and/or lack of adequate sleep.

Periods of no sleep can be as little as 20 hours or as long as 48 hours. Lack of proper rest in one person in these training situations can present danger. Lack of sleep and fatigue can cause personnel to not work as well or to think as clearly as they normally would.

People in the business of training troops should know that if a soldier’s sleep pattern is changed from an 8-hour sleep cycle to a 4-hour cycle, it can negatively impact performance. When working with explosives, this can yield dangerous consequences. This change in sleep cycles represents another element with which leaders and trainers must contend.



Mental and physical processes are adversely affected with lack of sleep. Research has shown the lack of sleep affects the cognitive function and physical performance. The lack of sleep will have a direct affect on the abilities of the individuals performing tasks and the level of stress will increase where either the physical or psychological demands are exceeded. This is a self perpetuating cycle: lack of sleep, inability to function normally, increased stress, and inability to properly sleep.

Leaders of training exercises are also susceptible to fatigue. They are certainly under increased stress as they are responsible for their SMs. They generally are under time constraints to get the training done in a specific time period on the range and they must rise earlier and go to bed later as they make sure everything is organized and ready for the exercise. So, not only must they watch for it in their troops, but they must be on guard against their own fatigue. Unfortunately, this is difficult to measure and individuals handle it differently.

In training and in combat, efficiencies and operations are affected by the SM's ability to perform; therefore, managing the amount of fatigue present in members of the operation is an essential element for the leader's consideration.

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IF IT WORKS WHERE YOU ARE, SHARE THE WEALTH!

If there is some aspect of an explosives safety program or briefing that has worked well at your duty station, we would be happy to pass the word to the readers of this publication. E-mail us at cummings@dac-emh2.army.mil or durand@dac-emh2.army.mil.

WEBCAT

Use WebCat, the U.S. Army Defense Ammunition Center's web-based library catalog. WebCat provides a worldwide web home page which easily guides you to the library's catalog. The collection consists of technical reports on explosives, ammunition and hazardous materials; archival documents dating back to World War I, and current government publications.

To access WebCat, go to www.dac.army.mil/es/ and scroll down to the link to WebCat. Click on the WebCat icon, then click on LIBRARY CATALOG.


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EXPLOSIVES SAFETY SURVEYS

In the last issue of the explosives safety bulletin, you learned that one mission of USATCES is the tracking of Department of Defense Explosives Safety Board (DDESB) explosives safety surveys. Representatives of the DDESB periodically visit Army installations to conduct explosives safety surveys and to provide explosives safety consultation. The DDESB provides a report of the completed survey to the Office of the Director of Army Safety (ODASAF) detailing any findings, observations, and recommendations.

ODASAF forwards the report to the major command (MACOM) of the surveyed installation. The MACOM is tasked to report corrective actions taken or planned, to include milestones, in response to findings of the DDESB survey report. The response is provided to USATCES for review and further transmittal to the DDESB.

USATCES tracks survey results to assist in the identification of findings that affect the entire Army. When required, recommendations for corrective measures are made to the ODASAF.



Tracking also allows USTACES to provide support to units in accomplishing corrective measures required to comply with Department of the Army and Department of Defense ammunition and explosives safety standards. Looking for trends in survey findings and getting that information out to the units allows you to review your operations for similar shortcomings.

The most prevalent survey finding during FY 99 concerns explosives safety submissions. A number of installations either lacked a proper site plan for areas involving ammunition and explosives or the site plan did not accurately reflect ongoing operations. USATCES has published a pamphlet to assist site plan developers. It is USATCESP 385-02, 15 Apr 98, Site and General Construction Developer's Guide. This guide, in addition to other useful tools, can be downloaded from the USATCES web page at the address <http://www.dac.army.mil/es/>.

Another area for concern is a systemic problem regarding response to fires involving ammunition and explosives. Survey findings have highlighted inadequacies in fire prevention, protection, and suppression programs. Units must ensure that the requirements of chapter 3, DAP 385-64, 28 Nov 97, Ammunition and Explosives Safety Standards, are met.

Other deficiencies noted include quantity-distance (QD) violations, inadequate or non-existent lightning protection systems (includes lack of adequate records of inspections and testing), improper routing of overhead wires to explosives structures, and inadequate personnel protection.

We encourage all installations to conduct periodic review of their ammunition and explosives operation areas for compliance with Department of the Army and Department of Defense ammunition and explosives safety standards. This will go a long way to ensure that your area is ready for a visit from the DDESB and more importantly, provide a safe working environment.

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